

1.5 μm range.

[0024] The cobalt is incorporated in particular for forming a bonding layer; less than 4 weight % would be undesirable because the toughness deteriorates and nicks arise in the cutting edge. Conversely, if in excess of 12 weight % is incorporated, the hardness of the base material deteriorates, degrading the resistance to wear during high-speed cutting; at the same time, the adhesiveness deteriorates remarkably--owing to low affinity--between the cobalt, and the compound thin film and the hard-carbon thin film, because in situations in which a powerful external force is applied to the cutting edge, the highly hard thin films cannot follow the deformation in the base material, and the thin films end up peeling away from their interface with the carbide base material.

[0025] TaC, VaC and the like, effective in checking WC grain growth and effective in enhancing cutting-edge strength, may also be incorporated into the carbide base material.

[0026] Moreover, should the average crystal-grain size of the WC be 0.1 μm or less, distinguishing the grain size by evaluation methods at present would be challenging; and an average crystal-grain size of 1.5 μm or more would be undesirable because if the film were abraded, large WC particles within the base material would drop out, giving rise to significant fracturing. The grain size of the WC has an extreme impact on the toughness of the base material, and taking results of evaluating adhesiveness of the compound thin film and the hard carbon thin film into consideration, it is preferable that the average WC grain size be 0.1 to 1.5 μm .

[0027] Herein, a compound thin film or a hard carbon thin film is coated onto the base material noted above. The compound thin film is composed by combining one or more elements selected from the group titanium, chromium, vanadium, silicon and aluminum, and one or more of the elements carbon and nitrogen. Inasmuch as the exceeding strength and high anti-oxidization properties of this compound thin film enable improved anti-wear properties and prolonged machining-tool life, and at the same time compared to a WC surface, thermal and chemical reactions with the workpiece are restrained, the chip-discharging faculty is made better. In addition, since weld-adhesion of the workpiece is controlled, the machining resistance is